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REMARKS

Applicants appreciate the thorough search conducted by the Examiner in examining the above-identified application. Applicants have endeavored to amend the application in a sincere effort to overcome the objections and rejections, and reconsideration is requested in view of the amendments above and the remarks below.

Claims 1, 2, 4-10, 12-14 and 16-21 have been amended. Support for the amendments to the claims can be found in the specification on page 8, line 13 through page 9, line 20; page 10, lines 27-29 and Figs. 2-5.

Claims 22-25 have been added.

No new matter has been added.

In the Specification

Applicants have amended the paragraph in the specification beginning at page 10, line 27 to more clearly point out that which applicants regard as the invention. Support for the amendments to the specification can be found in the Abstract, lines 14-18, as originally filed.

No new matter has been added.

In the Drawings

The Examiner has objected to the proposed drawing corrections in the Amendment dated June 5, 2002 stating that such changes introduce new matter and that the drawings must show every feature of the invention specified in the claims.

With respect to Fig. 6, applicants resubmit Fig. 6 in view of the above amendments to the specification. Applicants respectfully submit that the amended

specification supports the second embodiment of the invention wherein, as illustrated in Fig. 6, the injector cavity includes an inlet nozzle 50 and a throat region 44 that extends to and becomes the exit nozzle portion, i.e., exit end 51, so that this exit nozzle portion maintains the same diameter as the throat region. That is, as stated by the Examiner, exit end 51 may have a constant cross section channel down stream of the throat. Again, support for the amendments to the specification can be found in the Abstract as originally filed.

Applicants also submit amended Fig. 2 showing a heater at the exit nozzle as recited in the specification at page 13, lines 2-4 and recited in amended claim 11.

Fig. 6 and the amended informal drawing of Fig. 2 are attached hereto for the Examiner's review. Upon approval, formal drawings of both Fig. 6 and amended Fig. 2 will be submitted to the draftsman.

No new matter has been added.

35 USC 112 Rejections

In the above-identified office action, the Examiner has rejected claims 1-21 under 35 USC 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Applicants submit that the amendments to the claims clarify that the throat region has at least a first aperture adjacent to its first and second ends for injecting a first chemical vapor deposition fluid into the throat region to allow for atomization of the first chemical vapor deposition fluid by the carrier fluid and mixing thereof. Support for

the amendments can be found in the specification at page 8, line 13 through page 9, line 20. Accordingly, it is respectfully submitted that amended claims 1-21 overcome the 35 USC 112, first paragraph, rejections.

Claims 1-21 have also been rejected under 35 USC 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicants submit that in view of the above amendments to the claims clarifying the invention and correcting for antecedent basis errors, amended claims 1-21 overcome the 35 USC 112, second paragraph, rejections referenced in the above-identified office action.

No new matter has been added.

35 USC 102 Claim Rejections

Claims 1, 3-10, 13, 15-21 (as best understood) are rejected under 35 USC 102(b) as being anticipated by Gwyn (U.S. Patent No. 4,397,422).

As recited, amended independent claims 1 and 13 clarify that the instant invention is directed to an apparatus for delivering a plurality of chemical vapor deposition fluids to a chemical vapor deposition chamber that includes an inlet nozzle to receive a carrier fluid, a throat region to receive a chemical vapor deposition fluid and an exit nozzle to receive the atomized chemical vapor deposition fluid and carrier fluid. The inlet nozzle has a first diameter and is configured to maintain a first pressure and temperature. The throat region, having a second pressure and temperature, has a second diameter that is less than the first diameter of the inlet nozzle. The inlet nozzle is connected to the throat region at a first end thereof

whereby the throat region is adapted to receive the carrier fluid from the inlet nozzle. The throat region also has a first aperture adjacent to its first and second ends for injecting the first chemical vapor deposition fluid into the throat region to allow for atomization of the first chemical vapor deposition fluid by the carrier fluid and mixing thereof. The exit nozzle is attached to the second end of the throat region.

In a first embodiment of the invention, as recited in amended independent claim 1, the exit nozzle has a third diameter greater than the second diameter to allow for a substantial decrease in an exit pressure. This configuration of the exit nozzle maintains the exit pressure and a third temperature for the atomized first chemical vapor deposition fluid and the carrier fluid for introduction of the same into the chemical vapor deposition chamber.

In a second embodiment of the invention, as recited in amended independent claim 13, the exit nozzle has the same dimensions as the throat region such that the exit nozzle is an extension of the throat region. This configuration of the exit nozzle maintains the second pressure and second temperature for the atomized first chemical vapor deposition fluid and the carrier fluid for introduction of the same into the chemical vapor deposition chamber.

With respect to the Gwyn patent, applicants submit that the present invention is not anticipated by Gwyn. Anticipation is but the ultimate or epitome of obviousness. To constitute anticipation, all material elements of a claim must be found in one prior art source. In re Marshall, 577 F.2d 301, 198 USPQ 344 (CCPA 1978).

Applicants again submit that Gwyn represents non-analogous art that teaches a paint-spraying device for mixing and spraying different colorants utilizing a venturi mixer system. It does not disclose or teach an apparatus for delivering chemical vapor deposition fluids into a CVD chamber. Referring to Fig. 1 and column 2, lines 18-49, Gwyn only discloses a colorant mixing and spraying device (10) that includes a venturi mixer (18) having an inlet chamber (17), a throat region (19) and an outlet chamber (21). Three tubes (20) are connected to the throat region (19) whereby colorant is suctioned into the throat region from different containers (22) by the flow rate of air flowing from the inlet chamber (17) into the throat region (19). The colorants are mixed together in the venturi throat (19). The mixed colorant then flows from chamber (21) through a hose (26) to a spray gun (28) at a pressure high enough to vaporize the paint.

As recited in amended independent claims 1 and 13, the chemical vapor deposition fluid is atomized by the carrier fluid within the throat region of the apparatus for delivering chemical vapor deposition fluids into a CVD deposition chamber. The Gwyn patent does not recite that the colorants introduced into its throat region are atomized by the air flowing there-through. Gwyn is limited to simple mixing of the colorants within the throat region to achieve a final colorant mixture. (Col. Lines 39-42.) The mixed final colorant undergoes further mixing in the outlet chamber (21) and is then vaporized by pressure through hose (26) to spray gun (28). Furthermore, Gwyn does not disclose differing temperatures within the inlet chamber, throat region and outlet chamber, nor does it disclose an exit nozzle configured to introduce atomized

chemical vapor deposition fluid and carrier fluid in a CVD chamber. Still further, Gwyn does not disclose an exit nozzle having the same diameter as the throat region, as recited in amended independent claim 13.

Accordingly, applicants submit that the claims of the instant invention include limitations not disclosed nor contemplated by Gwyn such that Gwyn does not anticipate nor render obvious the instant invention.

35 USC 103 Claim Rejections

Claims 2, 11, 12, and 14 are rejected under 35 USC 103(a) as being unpatentable over Gwyn (U.S. Patent No. 4,397,422). As discussed above, Gwyn does not anticipate nor render obvious the instant invention due to limitations in the invention which are not disclosed in Gwyn. Gwyn does not disclose an apparatus for delivering chemical vapor deposition fluids into a CVD deposition chamber which allows for a carrier fluid to atomize a chemical vapor deposition fluid within a throat region of the apparatus.


With respect to claims 2, 12 and 14, the Examiner states that it would have been obvious to one of ordinary skill in the art to alter the inlet and exit nozzle angles for optimization dependent of application criteria. Applicants disagree as Gwyn does not disclose or suggest altering a nozzle angle such that the nozzle is configured to introduce an atomized chemical vapor deposition fluid and carrier fluid into a CVD chamber. Moreover, for the reasons cited above, independent claims 1 and 13 as amended, from which claims 2, 11, 12 and 14 depend, are patentably distinct over the

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cited prior art of Gwyn, and as such, put their corresponding dependent claims in a condition for allowance.

It is respectfully submitted that the application has now been brought into a condition where allowance of the case is proper. Reconsideration and issuance of a Notice of Allowance are respectfully solicited. Should the Examiner not find the claims to be allowable, Applicants' attorney respectfully requests that the Examiner call the undersigned to clarify any issue and/or to place the case in condition for allowance.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims

Claims 1, 2, 4-10, 12-14 and 16-21 have been amended as follows.

1. (Twice Amended) An apparatus for delivering a plurality of chemical vapor deposition fluids to a chemical vapor deposition chamber, comprising:

an inlet nozzle having a first diameter adapted to receive a ~~chemical vapor deposition carrier fluid as one of said plurality of fluids~~, and configured to maintain a first pressure and a first temperature;

a throat region, having a first and second end, ~~connecting~~ connected to said inlet nozzle at said first end, said throat region having a second diameter less than said first diameter and adapted to receive said ~~chemical vapor deposition carrier fluid~~ from said inlet nozzle, said throat region configured to maintain a second pressure and a second temperature, and having at least ~~one~~ a first aperture adjacent to said first and second ends for injecting a first chemical vapor deposition fluid into said throat region ~~sufficient~~ to allow for the atomization of said first chemical vapor deposition fluid by said carrier fluid ~~and mixing of at least one said atomized first chemical vapor deposition fluid requiring atomization to with~~ said ~~chemical vapor deposition carrier fluid~~; and,

an exit nozzle, connected to said throat region at said second end, having a third diameter greater than said second diameter to allow for a substantial decrease

18 in exit pressure, configured to maintain said exit pressure and a third
19 temperature for said atomized first chemical vapor deposition fluids and said
20 carrier fluid~~chemical vapor deposition gases~~, and ~~adapted~~ configured to
21 introduce said atomized chemical vapor deposition fluids and said carrier
22 fluid~~chemical vapor deposition gases~~ in at~~the~~ chemical vapor deposition
23 ~~processing~~ chamber.

1 2. (Twice Amended) The apparatus of claim 1 wherein said inlet nozzle having
2 said first diameter is adapted to receive and funnel said ~~chemical vapor deposition~~
3 carrier fluid to said throat region having second diameter, said inlet nozzle narrowing
4 at an angle in the range of forty to sixty degrees.

1 4. (Twice Amended) The apparatus of claim 1 wherein said second pressure and
2 said second temperature are selected to present a condition for atomization of said first
3 chemical vapor deposition fluids.

1 5. (Twice Amended) The apparatus of claim 1 wherein said ~~inlet nozzle, throat~~
2 ~~region, and exit nozzle are adapted to receive at least one of said plurality of first~~
3 chemical vapor deposition fluids as comprises a precursors, ~~and at least one of said~~
4 ~~plurality of chemical vapor deposition fluids as dopants for a chemical vapor deposition~~
5 ~~process~~.

1 6. (Twice Amended) The apparatus of claim 1 wherein said throat region further
2 comprises at least a second aperture, ~~two or more apertures~~ adjacent to said first and
3 second ends, ~~adapted to allow for the mixing of two or more of said plurality of~~ for
4 injecting a second chemical vapor deposition fluids into said throat region to allow for
5 atomization of said second chemical vapor deposition fluid by ~~to said chemical vapor~~
6 ~~deposition carrier fluid, and allow for mixing each of said two or more of said plurality~~
7 ~~of atomized first and second chemical vapor deposition fluids with said carrier~~
8 fluid introduced separately through individual apertures.

1 7. (Twice Amended) The apparatus of claim 1 wherein said throat region is
2 configured to maintain said first pressure to be greater than said third pressure to
3 enhance atomization of said chemical vapor deposition fluids ~~with said chemical vapor~~
4 ~~deposition carrier fluid.~~

1 8. (Twice Amended) The apparatus of claim 1 wherein said throat region ~~second~~
2 ~~diameter~~ is adapted such that said second pressure is lower than said first pressure,
3 allowing for said first chemical vapor deposition fluids to be injected into said throat
4 region.

1 9. (Twice Amended) The apparatus of claim 1 wherein said inlet nozzle is adapted
2 to receive said ~~chemical vapor deposition carrier fluid~~ at a constant flow rate ensuring
3 said second pressure being maintained constant through said throat region.

1 10. (Twice Amended) The apparatus of claim 16 wherein said ~~throat region is~~
2 ~~adapted to receive said plurality of~~ first and second chemical vapor deposition fluids
3 are introduced separately and simultaneously into said throat region without pre-
4 mixing.

1 12. (Twice Amended) The apparatus of claim 1 wherein said exit nozzle is ~~adapted~~
2 ~~to receive from said throat region said chemical vapor deposition carrier fluid and said~~
3 ~~plurality of chemical vapor deposition fluids mixed and atomized together, said exit~~
4 ~~nozzle expanding~~ expands to said third diameter from said throat region second
5 diameter at an angle in the range of twenty to forty degrees.

1 13. (Twice Amended) An apparatus for delivering a plurality of chemical vapor
2 deposition fluids to a chemical vapor deposition chamber comprising:
3 an inlet nozzle having a first diameter adapted to receive ~~one of said plurality of~~
4 ~~chemical vapor deposition fluids as a chemical vapor deposition carrier fluid,~~
5 and configured to maintain a first pressure and a first temperature;
6 a throat region, having a first and second end, ~~connecting~~ connected to said inlet
7 nozzle at said first end, said throat region having a second diameter less than
8 said first diameter, and adapted to receive said ~~chemical vapor deposition~~
9 carrier fluid from said inlet nozzle, said throat region configured to maintain a
10 second pressure and a second temperature and having at least ~~one a first~~

11 aperture adjacent to said first and second ends for injecting a first chemical
12 vapor deposition fluid into said throat region ~~sufficient~~ to allow for the
13 atomization of said first chemical vapor deposition fluid by said carrier fluid
14 and mixing of at least ~~one of said~~ atomized first ~~plurality of~~ chemical vapor
15 deposition fluids ~~to~~ with said chemical vapor deposition-carrier fluid; and,
16 an exit nozzle, connected to said throat region at said second end, having said
17 second diameter, said exit nozzle configured to maintain said second pressure
18 and said second temperature, such that said exit nozzle is an extension of said
19 throat region having the same dimensions as said throat region, said exit region
20 configured and ~~adapted~~ to introduce said atomized first chemical vapor
21 deposition fluids and said ~~chemical vapor deposition-carrier fluid in a said~~
22 chemical vapor deposition ~~processing~~ chamber.

1 14. (Twice Amended) The apparatus of claim 13 wherein said inlet nozzle having
2 said first diameter is adapted to receive and funnel said ~~chemical vapor deposition~~
3 carrier fluid to said throat region having said second diameter, said inlet nozzle
4 narrowing at an angle in the range of forty to sixty degrees.

1 15. The apparatus of claim 13 wherein said throat region is configured to operate at
2 a critical Mach number of 1.0.

1 16. (Twice Amended) The apparatus of claim 13 wherein said second pressure and
2 said second temperature are selected to present a condition for atomization of said first
3 chemical vapor deposition fluids.

1 17. (Twice Amended) The apparatus of claim 13 wherein said ~~inlet nozzle, throat~~
2 ~~region, and exit nozzle are adapted to receive at least one of said plurality of first~~
3 ~~chemical vapor deposition fluids as comprises a precursors, and at least one of said~~
4 ~~plurality of chemical vapor deposition fluids as depants for a chemical vapor~~
5 ~~deposition process.~~

1 18. (Twice Amended) The apparatus of claim 13 wherein said throat region further
2 comprises at least a second aperture, ~~two or more apertures adjacent to said first and~~
3 ~~second ends,~~ ~~adapted to allow for the mixing of two or more of said plurality of for~~
4 injecting a second chemical vapor deposition fluids into said throat region to allow for
5 atomization of said second chemical vapor deposition fluid by ~~to said chemical vapor~~
6 ~~deposition carrier fluid, and allow for mixing each of said two or more of said plurality~~
7 of atomized first and second chemical vapor deposition fluids with said carrier
8 fluid introduced separately through individual apertures.

1 19. (Twice Amended) The apparatus of claim 13 wherein said throat region, having
2 said second diameter, is adapted such that said second pressure is lower than said first

3 pressure, allowing for said first chemical vapor deposition fluids to be injected into
4 said throat region.

1 20. (Twice Amended) The apparatus of claim 13 wherein said inlet nozzle is
2 adapted to receive said ~~chemical vapor deposition~~ carrier fluid at a constant flow rate
3 ensuring said second pressure being maintained constant through said throat region.

1 21. (Twice Amended) The apparatus of claim ~~13~~ 18 wherein ~~said throat region is~~
2 ~~adapted to receive said plurality of~~ first and second chemical vapor deposition fluids
3 are introduced separately and simultaneously into said throat region without pre-
4 mixing.

Please add new claims 22-25 as follows:

1 22. (New) The apparatus of claim 1 wherein said first chemical vapor deposition
2 fluid comprises a dopant.

1 23. (New) The apparatus of claim 13 wherein said first chemical vapor deposition
2 fluid comprises a dopant.

1 24. (New) The apparatus of claim 6 wherein said throat region further comprises at
2 least a third aperture for injecting a third chemical vapor deposition fluid into said

3 throat region to allow for atomization of said third chemical vapor deposition fluid by
4 said carrier fluid, and allow for mixing of said atomized first, second and third chemical
5 vapor deposition fluids with said carrier fluid.

1 25. (New) The apparatus of claim 18 wherein said throat region further comprises at
2 least a third aperture for injecting a third chemical vapor deposition fluid into said
3 throat region to allow for atomization of said third chemical vapor deposition fluid by
4 said carrier fluid, and allow for mixing of said atomized first, second and third chemical
5 vapor deposition fluids with said carrier fluid.

In the Specification

The paragraph beginning at page 10, line 27 was deleted and replaced with the following paragraph:

Fig. 6 is a diagram of an alternate embodiment of the cross-flow injector with the expansion nozzle, i.e., ~~on the exit end nozzle 42~~, eliminated. Exit end 51 depicts the alternate design, having substantially the same diameter as that of the throat 44, D_2 . In particular, Fig. 6 shows that in this embodiment the injector cavity includes an inlet nozzle 50 and a throat region 44. The inlet nozzle 50 is tapered to meet the smaller diameter of the throat region 44, and the throat region 44 extends to and becomes the exit nozzle portion, i.e., exit end 51, so that this exit nozzle portion maintains the same diameter as the throat region.